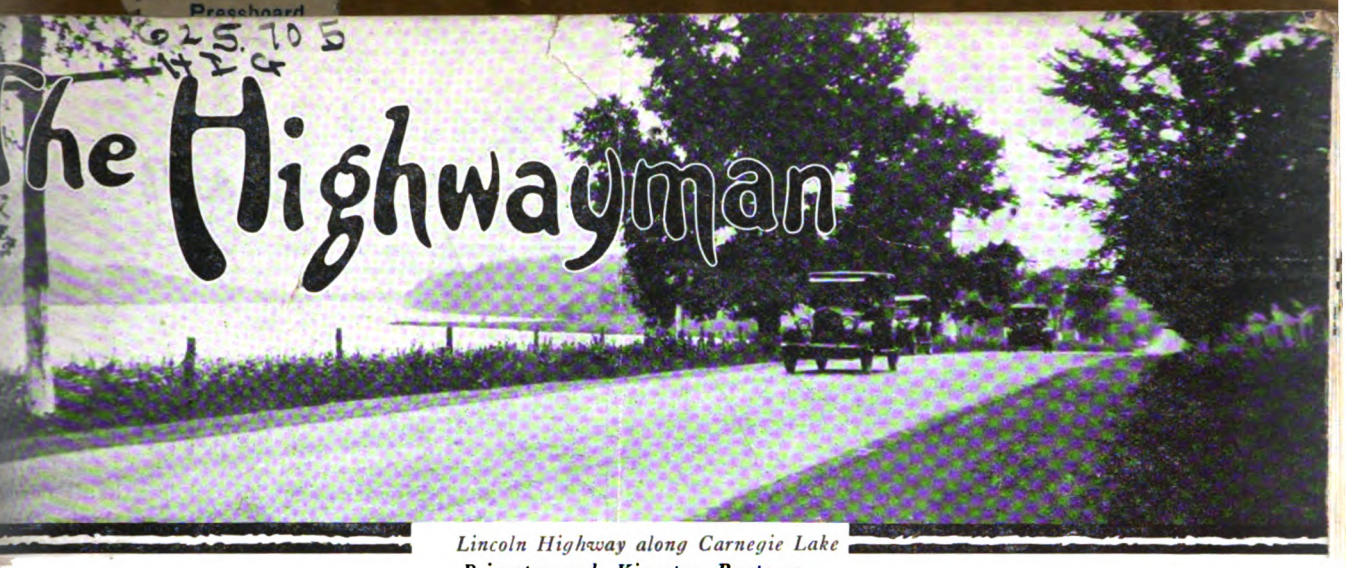
The Highwayman



Lincoln Highway along Carnegie Lake
Princeton and Kingston, Route 13.

The Highwayman Is Out for More and Better Roads in New Jersey

January, 1923
Vol. III
No. 1

I Am Going To Tell You How That $40,000,000 Is Being Spent!

$40,000,000 is a lot of money.

Especially when it is *your* money.

The $40,000,000 which is to be spent for roads in New Jersey in the next five years *is* your money. Most assuredly you will be interested in watching how it is spent—in knowing whether or not for every dollar spent you are getting a dollar's worth of roads.

It is an important part of my job to let you know exactly how that money is being spent. As soon as the five-year road building program is laid out, which will be sometime this winter, I am going to let you know what it includes.

Then, as the work progresses, I am going to tell you of every contract that is let, keep you posted on how the work is being done, let you know what roads will be available for your use as detours while the main roads are under construction, and inform you promptly as each of the new sections of roads is open to traffic.

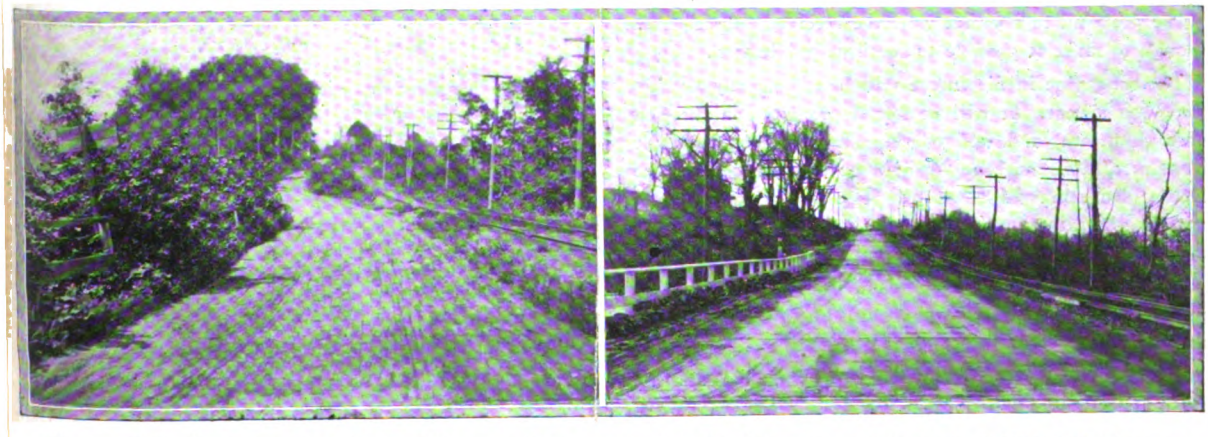
Time was, when New Jersey among all the states in the union was known as "the mother of good roads." *She must again achieve that enviable position!*

A state, no less than an individual, is known by its ideals. The very best in roads is one of the ideals which we should set ourselves. In these days there is no more excellent measure of the progress and prosperity of any community than its roads. The intelligent co-operation and backing of the road-using public is the greatest help which any Highway Department can have.

This work is up to you, not only for your selfish interests as an individual, but also because you are a good citizen.

Let us all work to put New Jersey—*first!*

The Highwayman



Along which of these two roads would you rather own property? Of course good roads PAY! (A place on Route 2, Section 2, between Bordentown and Roebling before and after modern road construction).

The Highwayman

Published Monthly By
Highway Publications, at Trenton, N. J.

THE HIGHWAYMAN will be sent to any address upon receipt of subscription price of $1.00 per year.

The Highwayman Goes On!

But This Is Your Last Copy, Unless You Are A Paid Subscriber

As announced in our last issue, the subscription list of the Highwayman had grown to such dimensions that it could no longer be published for free distribution by the Highway Department.

As stated at that time, the HIGHWAYMAN was to be continued only if we received a sufficient number of paid subscriptions to enable us to publish it.

We are glad to say that we have received subscriptions enough to make it possible to continue publication.

The magazine in the future will be sent to any address for $1.00 a year. It will be issued promptly on the first of each month, and will continue to carry the *Monthly Bulletin of Detours,* brought right up to the minute. The Detour Bulletin will cover all State and County roads, and will be printed on a separate sheet, handy to slip into the pocket.

This feature alone will be well worth the subscription price, (less than nine cents a copy) to anyone who uses the roads.

This is the last issue of the Highwayman which will be sent out to the old subscription list.

If you wish to continue to receive "THE HIGHWAYMAN" SEND IN THE ENCLOSED BLANK TODAY.

Signs of the Times

The times are out of joint if one must judge by various advertising signs which are posted along our highways. One often finds in driving that they are barely holding their own if the mileage indicated on the signs is taken as correct. Again one may find that his speedometer is not registering properly when he finds that he has covered a mile, judging from the signs, in much less than 1 minute.

Where proper provision is not made for signing highways by state highway departments the proper placement of advertising signs may be a help to the highway user. Incorrect signs or ugly signs should not be permitted along any road . One does not have to be free from superstition to disbelieve in signs as seen in many places. The signing of roads and highways should be in control of state highway departments and accuracy and uniformity insisted upon.—*Highway Engineer & Contractor.*

Got On His Nerves

"Why did you rise up and hit that man who was complaining about the discomforts of traveling in a Pullman?"

"Less than a week ago," said the beligerent person with a shudder." less than a week ago, I completed a trip across the continent in a flivver"—Birringham Age Herald.

The Asphalt Plant

List to the tale of the asphalt plant,
As it struggles and grunts and groans,
List to it rave and hear it rant,
As it eats up the sand and stones.

I'm racked with pain in my conveyor chain,
As I clank with every link,
And each sprocket wheel sets up a squeal
For the grease and oil I drink.

Now you'd feel sore, if your bearings wore
Right down to the rough cast steel,
With a lot of knocks in your mixing box,
I wonder how you'd feel?

I'm feeling hum, in my old sand drumm,
Of that I'll have to speak,
For the sand will scratch, so I need a patch
On the place where it's sprung a leak.

Now say, Old Topper, if in your hopper,
You, had a bum sand screen,
Where the stone would drift, when you tried to shift,
Now wouldn't you feel mean?

Why my main shaft near drives me daft,
And I don't know what to do,
Where the drive wheels hung, My shaft is sprung,
Now the darn things out of true.

My bottom door, neath the platform floor,
Is wore completely through,
It plays mean tricks, for it spoils the mix,
Do you wonder I feel blue?

Now I'm afraid, that each mixing blade,
Is just about to break,
And when they crash, my liners smash,
Thats why with fear I quake.

The plant thus spoke and belched black smoke,
From every stack it had,
And the foreman cussed, as a foreman must,
For the whole damn plant went bad.

—CHAS. BEVAN,
Dedicated to Inspector Floyd Woods
N. J. State Highway Dept

The Major instructing the Capt. in the use of small arms

Major General John P. Lawless and Captain Mike of the Road Marines

Because motorists insisted on violating the neutral zone on his job, John P. Lawless, maintenance foreman on State Highway Route No. 16, was forced to resort to military tactics. The following account of the incident was printed recently in the Newark Evening News:

Bernardsville, Sept. 30.—Mike Belby is sitting on the world this morning. This afternoon he may not be, if history repeats itself. For yesterday morning Mike was perched well on the summit, while in the afternoon things were not nearly so rosy.

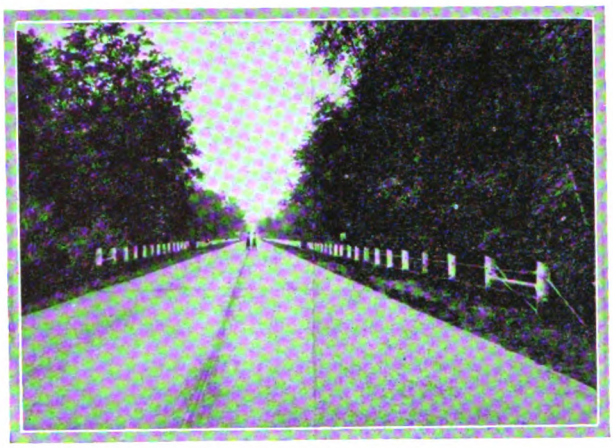
Mike, it might be explained, is a member of the gang working on Morristown road, which is now being covered with cracked stone within the limits of Bernardsville. Until yesterday morning his duties were of the heavier, even menial sort, swinging a pick or a shovel, or wheeling loads of stone.

But John P. Lawless, foreman on the job, had experienced trouble keeping automobiles off the side of the road where the stone was newly laid, and had been casting about for some way to end it. He heard of an old muzzle loading musket in the town hall and looked his henchmen over. His eye fell on Mike.

The upshot of a little negotiating was that Mike, erstwhile laborer, cast aside the implements of his trade, shouldered the old musket, unloaded but impressive when viewed from a distance, and began to mount guard along the edge of the newly laid stone. On his breast shone a new and highly polished health officer's badge, which Mike kept clean by recurrent rubbing with the sleeve of his coat.

Many a motorist hove into view to halt precipitately as Mike brought his gun to a position calculated to denote that he was ready for any eventuality. He ruled like a king till noontime, when it was decided traffic was so light the sentry was no longer necessary. Then he went back to the galleys.

This morning the cars were coming thickly again and Mike once more forsook his less fortunate companions, to pace back and forth and warn the errant driver that he must keep to the side where the stone had not been laid. Mike had only one wish, he declared, that Saturday afternoon traffic would prove so heavy that the foreman would decide he was needed as a guard rather than as a member of the heavy duty shift.



As far as surface indications go, a road like this looks 100% good, but how long it will "hold up" under traffic depends largely on how the sub-grading was made. In the article below, Mr. Gage tells how the Highway Department takes every possible precaution to have the sub-grading done right before a road can be put down.—(Route 5, in the vicinity of Budd Lake.)

Subgrades and Subgraders

R. B. Gage, Chemical Engineer

It has been quite definitely determined that the life of most surface pavements is shortened very much by an improperly prepared or unstable subgrade. Since the manner in which subgrades are prepared and the materials of which they are composed usually govern their stability to a great extent, it naturally follows subgrades will vary in both character and stability. In localities where the sub-soil is of fairly uniform composition, the subgrades should be quite uniform in character and stability. The unitiated might assume that such would be the case, but unfortunately there appears to be more of a variety of "Subgraders" than sub-soils. Experience usually is required for perfection. Consequently, some "Subgraders" who have had years of experience in road construction have become so expert that they can usually detect a variation of one-quarter inch in a subgrade surface from that specified without having to use a template or a straight edge. Such have been their claims and, the Department previously experienced some difficulty in determining the thickness of concrete surfaces and foundations.

Fortunately, the uncertainty regarding the thickness and quality of concrete surfaces and foundations was eliminated by the purchase of a Calyx core drill. With this equipment, it is possible to easily cut a core from a concrete pavement or foundation that permits the determination of both the thickness and the quality of the concrete. It was soon discovered that something more than assurance was necessary to properly prepare a subgrade and that the Department had in a few cases paid for a greater thickness of concrete than was constructed, also that in some cases an excess thickness of concrete over that required was constructed at points where there was no justification therefor and had to be used in order that the surface of the concrete would have the required grade. The extra concrete thus required usually cost the contractor much more than the amount saved by the methods followed in constructing the subgrade.

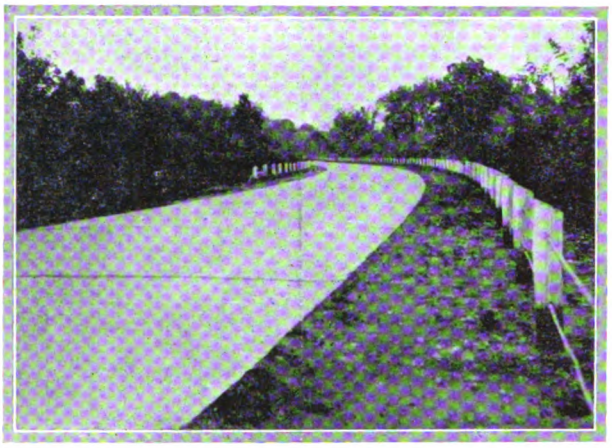
It was soon noticed that on those jobs where a mechanical subgrader was used the concrete generally had the required thickness at all points, also that the departures from the specified thickness were generally less than one-half inch; consequently, the pavement could be approved as having the average thickness specified when the same was determined from the cores cut from the pavement.

The writer is of the belief that a mechanical subgrader should be specified to be used on each job if possible, for it not only assured that the subgrade will be excavated to the required depth, but also produces a more uniform surface on the subgrade and, as previously stated, effects quite a saving in the quantity of concrete required. Some contractors, however, do not believe that a better surface will be constructed on a subgrade by the use of these mechanical subgraders than can be constructed without them, also that the expense incurred for the purchase and the operation of this equipment is not justified by the results secured. Similar objections have been made against the use of other improved types of road building equipment when such equipment was first brought into the market, yet in a short time it was usually noticed that this improved equipment is in general use by almost all contractors. It is seldom that a contractor will not change his mind when he sees that a greater profit can be made by such a change.

In view of the severe strain to which pavements are now subjected, it becomes of the utmost importance that a pavement or foundation has the required thickness at all points, otherwise failures are liable to occur at the thin places. Some of the premature failures in concrete pavements investigated have been found to be caused directly by the concrete not having the required thickness at the point where the failure occurred; consequently, the subgrade should be so prepared that these thin under-strength places in the concrete will be elimited.

In the past, the Department has paid the full contract price for pavements or foundations, and assumed that they had the required uniform thickness and strength. The core drill has shown that concrete pavements or foundations seldom have the required minimum thickness at all points unless a merchanical subgrader has been properly used. The Department should not pay the full contract price for defective work of this kind and, unless the defect is very serious, it is recommended that pavements or foundations which are slightly deficient in thickness be accepted and paid for at a reduction in price or, in other words, at what the pavement is really worth to the State. If this method of paying for defective pavements was used, it is safe to assume that the penalty thus imposed for inefficient work would amount to much more than the cost and operation of a mechanical subgrader; consequently, the objections which have been raised against the use of the mechanical subgrader would be automatically eliminated.

In recommending the use of a mechanical subgrader, the fact should not be overlooked that on certain types of work these subgraders cannot be economically operated. If the contractor is permitted to deposit the materials required for the concrete upon the subgrade, this fact prevents the economic operation of a subgrader, also on jobs where the pavement is less than eighteen feet in width or where only one-half of a pavement is constructed at a time, a mechanical subgrader cannot be economically used on account of the limited width of the workable space on the subgrade.



"Traffic hazards on curves may be materially reduced by constructing the curves with a long radius and by banking the roadway at the curve." Curves like this, on Route 5, at Budd Lake, give the motorist greater comfort, speed AND safety.

Elimination of Traffic Hazards in Highway Improvement

By Arthur H. Blanchard

An intimate relationship exists between the elimination of traffic hazards and the efficient design, construction and maintenance of highways. A momentous responsibility rests on Federal, state, county and municipal highway engineers to constantly realize the public duty which is imposed upon them to safeguard to the maximum extent the life and property of persons using the highways.

Traffic On City Streets

In the field of municipal highway improvement, more attention should be concentrated on methods to relieve congestion of traffic on city streets. The construction of ample widths of roadways, arterial diagonal streets and circumferential streets will materially assist in the relief of congestion of main traffic and business streets in many cities. State and municipal highway officials should cooperate in the routing of through traffic around the business section of large cities and even outside the limits of small municipalities. Marked relief from traffic congestion has resulted wherever this fundamental principle of city and town planning has been adopted. A detail of street construction, often overlooked in many municipalities, which materially aids in the safe use of streets, is the construction of curb corners with the longest radius practicable. With properly designed curb corners, the tendency of motor vehicles, in turning right-hand corners, to encroach upon the left hand side of the roadway is materially reduced.

Interurban Highways

State and county highway engineers may by proper highway design, construction and maintenance, eliminate or measurably reduce many traffic hazards.

Widths of roadways should be constructed which will allow the safe passage of all classes of vehicles utilizing a given highway. For a 2-lane state trunk highway, the paved width should not be less than 18 or 20 ft., depending upon the traffic to which the highway will be subjected.

Serious congestion is resulting on many trunk highways due to the temporary parking of motor vehicles undergoing repairs or stopping for brief intervals. These obstructions on the roadway may be obviated by the construction of 5-ft., shoulders of sufficient strength to carry standing vehicles. Cases have been noted where five vehicles within a distance of 1 mile on a highway outside of a municipality have been parked on the roadway undergoing repairs. This practice at night, especially in the case of a vehicle without a tail light, constitutes a serious source of danger.

On narrow roadways, 14 to 17 ft. in width, the safety of the traveling public may be increased by the marking of a center line on the pavement surface. Where traffic demands a greater width than a 2-lane highway, the construction of a 4-lane highway of 36 to 45 ft. in width is recommended. The construction of 3-lane highways should not be permitted as under no practicable traffic regulations is it feasible to safeguard travel on the center lane of travel.

Traffic hazards on curves may be materially reduced by constructing the curves with a long radius, banking the roadway of the curves constructing an extra width of the pavement on the pavements and eliminating distructions to view on the inside of the curves. Right angle corners within distances of each other of less than 500 ft. exist in many localities. These may be classified as ultra-dangerous traffic hazards and should be eliminated by the construction of a long double reverse curve in place of the two sharp curves and the intervening short straight stretch of roadway.

In many cases, hill crests on highways constitute as serious traffic hazards as sharp curves on level stretches of highways. The tendency of many motorists to travel in the center of the roadway when no approaching traffic is observed has caused many accidents at crests. A center line marked on the pavement over the crest materially reduces this traffic hazard. It is believed that the expense of placing danger signs, calling attention to this hazard, on the sides of the roadways approaching all dangerous crests would be justified.

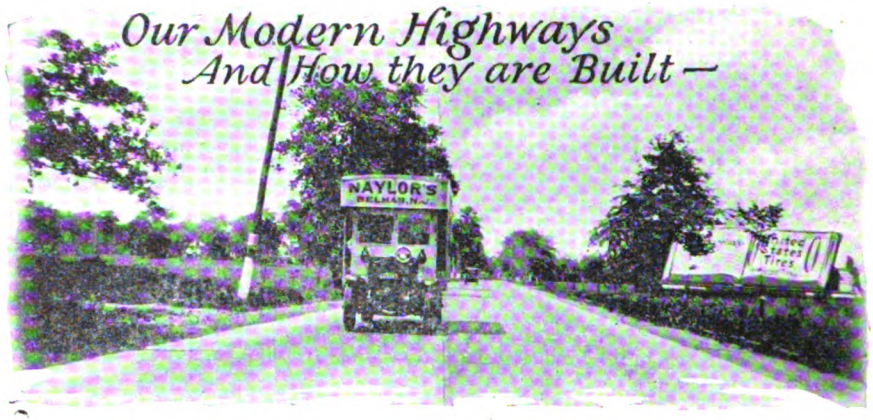
Railroad Grade Crossings

Railroad grade crossings are a constant source of accidents. It is evident that their total elimination is desirable but unfortunately is not practicable in all cases in the present state of the financing of highway improvements. Much can be done by proper design to reduce traffic hazards in the case of railroads crossing highways at grade. A clear sight of the railroad crossing for 500 ft., on each side should be provided and a clear sight of the railroad for 1000 ft., on each side of the highway is desirable. The width of all roadways crossing railroads should be at least 20 feet. For a distance of 100 ft., on each side of the railroad, the grade of the highway should be level or not over 2 ft. rise or fall in 100 ft. The suggestion by some officials to construct humps in the highway to slow down traffic approaching railroad crossings is unreservedly characterized as pernicious.

It is self-evident that the number of accidents due to traffic hazards may be materially reduced by proper danger signs.

Highway Maintenance

The field of highway maintenance provides many opportunities for reducing traffic hazards. Only one specific type of roadway will be mentioned in connection with maintenance. On gravel roads an excessive use of loose gravel has been the cause of many accidents while the traffic hazard of dense clouds of dust is apparent to all motorists who travel gravel roads which have not been so maintained as to eliminate or materially reduce the dust nuisance.



Our Modern Highways and How They Are Built; In Language Everyone Can Understand

By H. C. Shinn, Engineer of Special Assignments, N. J. State Highway Dept.

With the ever increasing use of automobiles, it becomes more and more important that the average citizen of the state should have at least a general knowledge of roads and road construction.

With forty million dollars to be spent, during the next five years, in this state on roads, YOU are vitally interested in knowing whether the money is being spent to the best advantage or not.

In the following article, Mr. H. C. Shinn, of the State Highway Department, has attempted to tell in words which even the layman can understand, just what problems are encountered in building a road, and how they are handled by the State Highway Department. We believe you will enjoy reading every word of this article, and certainly you will find it worth while to do so.

Experience in trying to plainly describe highway building to my friends and others who have not been trained in highway engineering, has brought to my mind the desirability of someone trying to write up the subject in plain understandable language. It has been charged by non-technical readers, that most technical writers and professional men garb their utterances in long drawn mysterious technical terms that are meaningless without one having an intimate knowledge of the particular work in question. Wherever in this article we have occasion to use technical terms, we will endeavor to give due explanation of the meaning thereof.

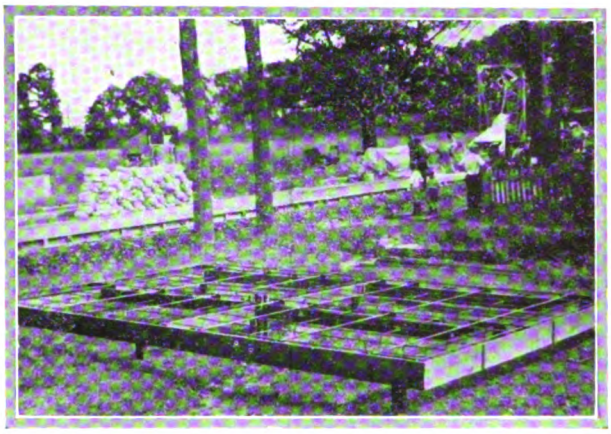
The First Undertaking in the Construction of a New Road, is the Making of a "Preliminary Survey"

When a highway is to be constructed, the first visible signs on the location of the road, of official activity, are the survey men, who are known in the office as "Field Party", engaged in making a "preliminary survey". This "preliminary survey" is a matter of taking only enough measurements (angles, distances, and elevations), to enable the engineers in charge of the "location work", to determine approximately the nature of the country through which improvement is to be made. From this "preliminary survey" is decided just how much detailed information will be required in order to intelligently locate the alignment of the proposed highway economically, and with the best interests of the traffic to use the highway in mind. For instance, althouga the new road will, in the main, follow the old existing road, there are often points where it seems desirable to change the alignment, in order to avoid sharp curves, low swampy ground upon which it would be uneconomical to construct new road, congested portions of towns or cities, railway grade crossings, etc. Without making a "preliminary survey", often along two proposed routes, it could not be determined which of the proposed routes is the most desirable, from every point of view.

The Importance of the "Preliminary Survey" Should Not Be Underestimated

As an example, I will quote an instance of location work on the Lincoln Highway, between Trenton and New Brunswick. The old highway curved in and out for a distance of about a mile. A continuation of the old highway, from the beginning of this mile stretch to the end of the section, would intersect with only one slight curve necessary, whereas the old road contained eight or nine more or less undesirable curves. The old road, too, consisted of macadam pavement built as a general thing, in a slight cut ranging from one to four or five feet. The nature of the ground throughout this whole section, was heavy sticky clay, the old road being below the surface of the surrounding land, was subject to the action of the under-ground water coming out of the saturated clay, emptying in the ditch along the road, and also forcing itself up through the road in such a way, that it kept the clay under the road lubricated, causing the small stones, of which the macadam pavement was built, to sink down into the clay "sub-grade" under the weight of heavy vehicles, usually in the Spring period of the year. The only solution of the drainage problem through this whole section, would have necessitated the construction of a large size sewer for several thousand feet, in addition to a system of lateral drains, comprising a net-work of smaller tile known as "French Drain", in order to carry off the surface and under-ground or "sub-surface" water, because the old road was almost level and the water could not be taken away otherwise.

By making a "preliminary survey" of both the old road for this mile section, and the continuation of the straight portion of the old road over private right-of-way, (new alignment), it became apparent that the cost of building the road through the new and improved alignment, would be slightly less than building over the old road, resulting in a very much improved alignment, and the elimination of the maintenance of an expensive sewerage system.



Another of the investments in road construction which does not show on the surface. The reinforcing rods have to be tied together before they are placed in position where the concrete is to be poured.

At the time this work was done, however, the residents along the road, no doubt, felt that a lot of money was being wasted on surveys, as they saw the survey parties working over this ground, again and again. Test borings, of course, had to be made through the proposed new alignment, in order to determine the probability of hitting rock, which was found in other places along this work, and although rock was encountered, it was not in sufficient quantity to prohibit the construction of the new and improved alignment.

This is only one of a great many typical cases that could be profitably written up to illustrate the desirability and economy of spending time and money on engineering before the construction work is undertaken, rather than rushing ahead over the alignment that was possibly laid out by a cow or a mule, and since followed by countless civilized people. Even in streets where the highway by necessity must follow the old established road in congested areas, due to economic reasons and to the necessity of serving people who have built homes and businesses along these highways, there are several distinct operations necessary for the completed survey before the construction work may proceed.

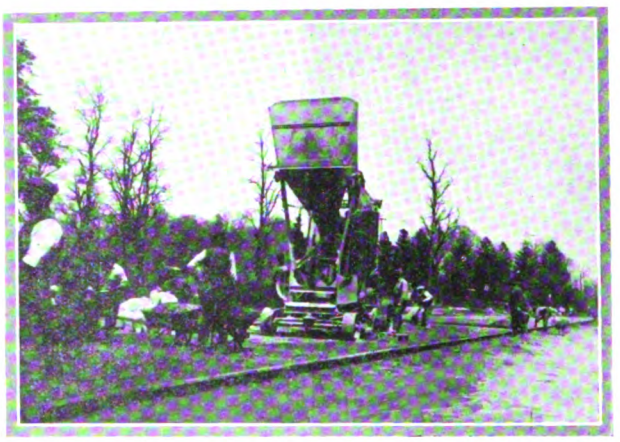
People Not Familiar With the Routine of Surveying, Misinterpret the Movements of the Survey Party

All engineers have met the curious and sometimes perturbed gaze of the residents along the road, after the first or second trip over the road, comprising some of the different operations necessary for the survey. Such comments as "What's the matter, make a mistake?"; and "So this is the way you spend the taxpayers' money!"; are quite common, and have to be endured, although we may be sometimes thin-skinned enough to resent these implications, but knowing that it would be futile to explain in detail to our questioner the reasons for the traversing of the road several times, the man usually grins and proceeds with his "knitting". Neighbors discuss the wanton waste over adjoining fences and at street corners, and thus misunderstanding grows and magnifies. I have tried to answer questions of my neighbors and friends, and often tried to explain to strangers, so I will now try to explain to you.

The Center Line of the Proposed Road Must First Be Determined and Staked Out

First, a line is run out with a surveying instrument known as a transit, which has a powerful telescope, and is so accurately constructed, that points may be set in a straight line for distances up to about a mile, on a clear day, with an accuracy within one-half inch at the most distant point. This is not unusual work, but is an every day occurrence with surveyors. Points are spaced along this line at certain definite intervals known as stations, for the purpose of survey data later to be acquired. This interval is 100 ft., as a general rule. Of course, there are angles in all roads, and the line referred to has to be curved where angles occur, because the highway will not be constructed on sharp angles except at street intersections or congested portions of grown up cities or towns. At the points where curves are necessary, considerable mathematical work has to be performed, depending upon the sharpness of the angle and the "degree" or flatness of the curve to be run. This matter of calculation is another source of wonderment and often annoyance to the casual observer who considers the taxpayers' money is being wantonly wasted, while several members of a survey party wait for the head of the party to complete his calculations, before actual staking out or marking can proceed.

Enormous quantities of material have to be handled and transported to the job in road building. The photograph above shows the type of industrial railway laid along the sub-grade over which narrow gage industrial railway trains transport the material to the "mixer."



Here is the machine which has made possible the building of modern hard surface roads—the "mixer" gorging itself with a batch of dry concrete materials preparing to masticate or mix these ingredients into concrete.

Survey Work Often Done Under Adverse Conditions

Right here, let me say that these men make up for every moment they are required to sit or stand and endure the gaze of the indignant observers, by hustling, often on the "dog trot" or run when conditions are propitious for fast work. They have to take your dust in the middle of the highway, take your hard glances and words because they are cluttering up your highway with their person, endure the heat of the hottest day of summer, and the cold of the coldest day of the winter, holding fast to the delicate instruments with numb fingers, using their heads to avoid being run down by criminally reckless drivers, and the strict and careful attention which the very need of his work demands, more tedious and careful than the carpenter fitting a careful piece of work. They have to be forever and constantly on the alert that one does not hold up performance of other men by lack of accuracy on his part, requiring that the work be done over, or that expensive construction work be ripped out at a later date. Lest the reader think that I am overdrawing the picture, let him observe for a few days the work of these men.

Topography (Location Of All Objects)

After running the "line" and recording its dimensions so that they can be reproduced on paper to a given scale "topography" is taken, by measurements from this, the above referred to center line, to each object that may have a bearing upon the construction of the road, including trees, poles, curbs, physical evidences of sewers, such as manholes and water pipes, such as valve boxes, curb valve boxes, hitching posts, fences, mail boxes, trees of all sorts, hedges, buildings, etc., etc. In addition to this, it is necessary to interview the local authorities of the water, gas, and other underground utility companies, and secure if and when possible, the locations of such underground structures, all of which locations are recorded and later reproduced on paper.

Bench Marks (Points Of Known Elevation)

Another operation requiring traversing of the whole road, is that of establishing what is known as "bench marks". "Bench marks" are points reasonably expected to remain permanent a number of years, or at least during the construction of the highway, the elevation of which is known or is determined with accuracy. In order to give you an idea of the term "accuracy", let me ask you to put one dot on a piece of paper, as fine as you can make the dot and still see it; about six inches away from this, make another very fine dot, lay a one foot rule down covering the center of these dots as accurately as you can, and at the end of this one foot rule, draw a very fine line. Now, pick up the rule and repeat the operation without paying any attention to the line you had drawn previously. You will see that, as careful as you can be, there will be quite a divergence between the two lines you have drawn. If you will now try to conceive of the accuracy of the instruments used, and the tedious care necessary in order to carry a line, either horizontally or level over a number of miles, and secure results in fractions of an inch, you will have some conception of the work required of engineers and surveyors.

In establishing the elevations of these "bench marks" it is necessary that the engineer start at known elevations, which points have been established by the "Geological Survey", at points distant several miles apart, throughout the state, and have a relation to mean high water mark of the ocean given in hundreds and thousandths of feet. When referring to the elevation of a particular "bench mark", the engineer either has to run from one known elevation to another known elevation, or has to run over his work, establish supplementary "bench

In some places, it is necessary to build only half of the road at a time in order to maintain traffic. This is not always possible because some roads have not the necessary width (Route 9, between Somerville and North Branch)

A view of a section of a newly completed state road showing the salt hay which is kept saturated with water for fourteen days before traffic is allowed on the road.

marks" for his later use and then return as carefully to the original starting 'bench mark" to determine the error of the work he has just performed. There is always an error, of course, in any work, but most people are surprised to know that it is possible, by average careful work, to run levels for a distance of five miles and return, with an error of not greater than a quarter of an inch. One might suppose that such accuracy was unnecessary, and the quarter of an inch which I have above referred to is not always necessary, but in a distance of five miles, the work would not be acceptable if it was over one inch out, for elevation, because on this basis of the elevation work is dependent, not only the grade of the pavement itself, but sewers where necessary, gutters, drains, etc., where a small error would prevent the flow of water. Also, the contractor is paid for the volume of earth removed, and other work, by measurements taken from such levels.

Inaccuracy in This Work May Prove To Be Extremely Costly

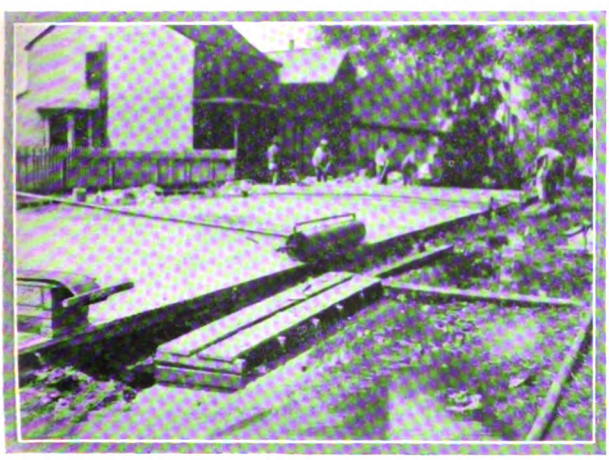
As an illustration of cost in connection herewith, let us suppose that an error of 1/10 of a foot were made for five miles, requiring a contractor to dig 1/10 of a foot, which is slightly more than an inch, deeper than he should have excavated, for a 30 ft. wide road, it would amount to 3000 cubic yards, or wagon loads, of earth, at an average cost of $1.50 per wagon load, to dispose of, the same would amount to $4,500.00 for excavation alone, just for this little mistake. This is only a beginning of what could be done in the way of making mistakes, if one were not fully on the alert to prevent it. There are expensive storm sewers that have to be constructed, that a very slight error in grades would make useless, and many other instances requiring constant alertness.

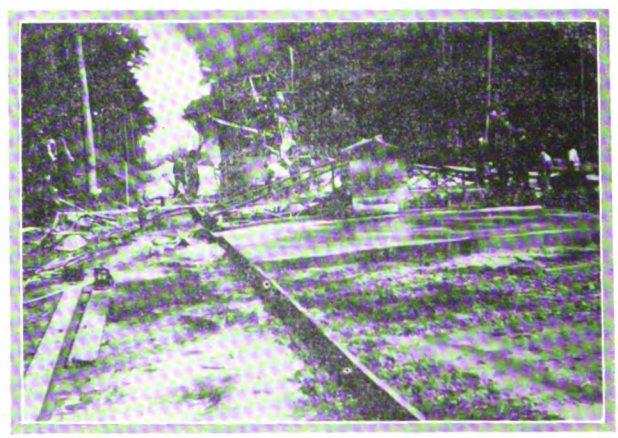
Measuring the Shape of Existing Road and Ground

After the second operation above described is completed, elevations have to be taken at every point where there is a practical break in the grade of the ground, in order that the quantity of earth to be removed or filled in, may be determined. Earth to be removed is termed "cut", and earth to be filled in, is termed "fill", in the nomenclature of engineers. The operation of determining the elevations of the ground along the center of the road is known as "profile levels". After the "profile levels" have been run, the elevations at right angles to the roadway, of the breaks in the ground, known as cross section levels are taken. When you see a young man with khaki trousers and flannel shirt, putees, and a long rod with funny looking marks on it, come into your front yard, it is for the purpose of obtaining the elevation of a point or points for the cross section levels. There are several reasons why these points of elevation are taken outside of the roadway. One is, in order that the road may be so designed that minimum damage will be done to the adjoining property by the backing up of drainage water, and another is that in some cases, where a deep cut is to be made, the slopes along the side of the road will go considerably back of the road proper, and these levels are necessary in order to determine the volume of earth to be removed or the amount of fill to be made.

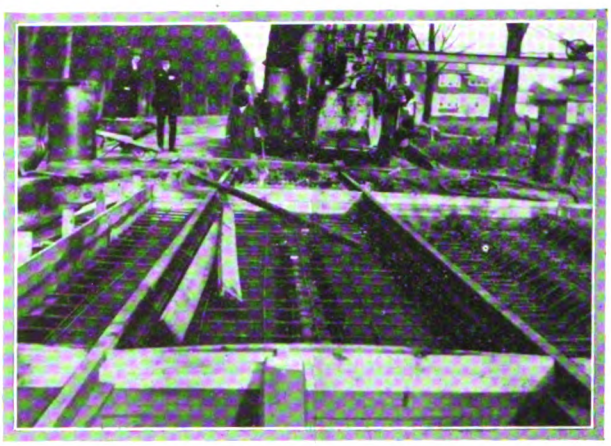
Property Surveys

In addition to the survey work in connection with actual construction to be performed, wherever change of elignment, excessive width of cut or fill, make the acquisition of additional property necessary, surveys of these parcels of property have to be made, and descriptions of the property made, from which agreements and deeds can be drawn. These surveys, although of very small tracts, often entail a very large amount of detailed infor-





After the mixed materials are dropped into place by the paving machine, the "concrete finishing machine" is employed to tamp the material down firmly into place and leave an even surface. Surplus water is removed by the use of a light metal roller which is run back and forth across the surface.



Where a bridge is to be constructed, extra reinforcing is necessary. This photograph shows the concrete forms and reinforcement in place ready for the concrete on the bridge near the city line of Trenton. Route 1.

mation, which has to be acquired from the deeds and records of the property owners adjoining the road, and from the records of the municipal and county offices. After the surveys and descriptions have been completed, they are turned over to the right-of-way division, who negotiate with the property owners for acquiring the land.

Survey Notes Made Into Maps and Plans

After all this field work is completed, several note books have been filled up with information recorded in mysterious symbols and figures as employed by the engineering craft, which are deciphered and computed and measured out or "plotted" on a map which shows all of the features, both large and small, entering into the problem to be studied. From the level notes is made a profile, which means exactly what it sounds like it should mean. The profile represents a section of the earth as though the road way were sliced right down the middle, and one slice was visible. Of course, since it is not possible to do this in actual size, it is made to a definitely known scale, from which, by laying a rule from any point, one can determine the elevation of the center line of theroad at that point. The same thing is true in a direction opposite to the center line, at right angles thereto. The cross sections taken at frequent intervals, usually not less than every 50 ft., represent a slice of the road the same as if you would cut it off at that point and had a view of the surface of the road and adjoining land for a distance of several feet back of the edge of the roadway.

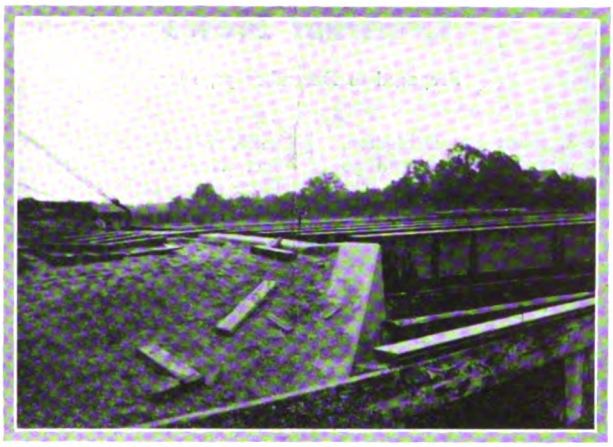
Quantities of Materials Computed From Plans

It can be seen that we now have an accurate plan or picture of the road as it exists, from which we can lay down grade lines, compute the earth that will have to be moved, the structures necessary to carry off the water that falls on the surface of the road and comes into the road from adjoining fields and intersecting roads, and the water which is found underneath the road. This last source of water is the most difficult to determine, and the hardest to deal with, and has the greatest effect upon the structure to be built. Most everyone knows that water put into a steel vessel and left to freeze, would break the vessel asunder, and it is, therefore, no wonder that water lying underneath a road pavement will freeze up and break the strongest pavement that can be laid, unless the pavement can rise uniformly with the heave of the frost action It would be difficult to conceive any stretch of road that would be absolutely uniform as to the quantity of water lying underneath its surface, or the depth below the pavement at which it exists. All of these conditions enter into the way in which the road will behave after it is constructed.

Study of Soil and Grades Determines Drainage System

Observation of the field engineers of both surface drainage conditions, and underground water, is important in order to intelligently design a drainage system. Certain conditions of the soil, the vegetation on the soil of the fields or lands surrounding and contributing its water to the road, the rate of fall of the earth towards the road, and the area draining towards the road, must all be taken into consideration, and the volume of water that will result on the roadway, be determined with a fair degree of accuracy. The underground water is much more difficult to determine, because it is not possible to go to the expense of digging down into the ground for a depth sufficient to determine the quauntity of water it contains, so that observations have to be made from excavations that have been made for one cause or another, along the road or in the vicinity thereof, condition of wells, the run-off of cesspools or leaching catch basins, may indicate to some degree, the nature of the soil, and the water contained therein. An engineer, to judge these conditions, should be a Sherlock Holmes, and study conditions for a long period, particularly at the wettest time of the year, in order to learn all that he can about drainage conditions. From this data, and information obtained from old residents, the road and its drainage are designed.

In this connection, I will give an example of the effect of drainage treatment on a portion of the Lincoln Highway, from Franklin Park towards New Brunswick. For a distance of about two miles, the road was practically level, the ground on either side of the road was too flat to allow drainage in that direction. Although the macadam road had existed for several years at this point, it was not possible to keep it in a safe condition for increased heavy travel throughout the whole year, on account of the very wet condition of the ground underneath it, together with the nature of the soil which was of a heavy clay. Farmers along the road with teams were frequently called upon to haul out automobiles stuck in the road, in the Spring of the year. Trucks have been known to be stuck for several days in this section. When this portion of the highway was rebuilt, an elaborate drainage system, consisting of storm sewer starting at a size of eight inches and increasing towards the outlet to twenty-four inches in diameter, was constructed as an outlet for both the surface water and the underground water. The surface water was fed to the storm sewer through concrete gutters placed along the side of the roadway. It was necessary to construct these concrete gutters, because there was no fall along the length of the road for the water to run off, and it was necessary to have a hard surface over which water would flow on a very slight grade, this slight grade being created by pitching the gutter alternately in a direction paralleling the length of the road, and to catch basins spaced at distances approximately 300 ft. apart. From the catch basins, the water emptied into the storm sewer, after the silt had been allowed to settle in the bottom of the catch basins. By the way, the function of the catch basin is to provide for a depth of opening below the outlet of the catch basins, in order that when the water from the street, carrying dirt, empties into it, the dirt will settle into the bottom of the silt basin, and the water will run out at a higher level into the storm



This is the bridge at Job's Creek, near New Gretna, New Jersey (Route 4). The building of the abutements looks like a simple job, but—(see photograph below).

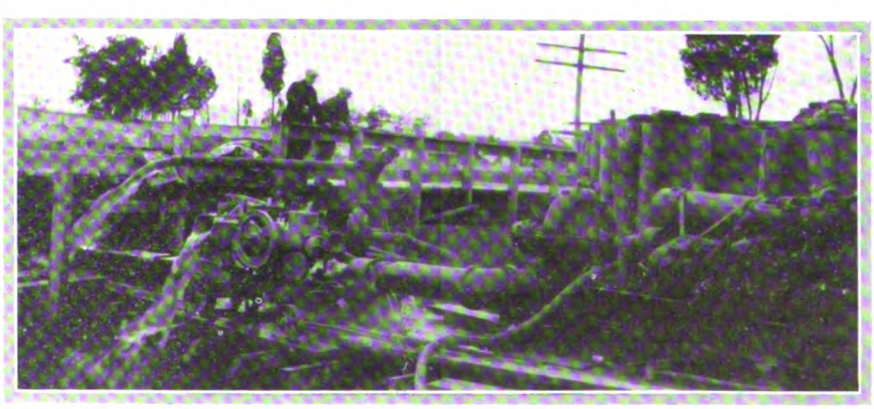
sewer. Without catch basins, storm sewers would soon become clogged with sand and debris. The outlet pipe from a catch basin is turned down below the surface of the water in the catch basin, at a sufficient depth, so that floating sticks and debris which will not settle to the bottom, will not be able to force its way into the sewer or clog up the opening.

The underground water in this case, as in many similar cases, was taken care of by a system of what is known as lateral and longitudinal "French Drains". A "French Drain" consists of a trench dug in the ground to a depth on an average of 3 ft. below the bottom of the pavement In the bottom of this ditch is laid porous or vitrified tile with open joints to a grade sufficient to carry off the water in the direction of the outlet. Around this tile, and over it, is deposited stone or slag which holds the ditch open and allows the surface of the ditch to "weep" into the porous trench and thence to the pipe below, going through the joints in the case of hard vitrified tile, and through the pipe and through the joints if porous tile is used. The lateral under-drains are what the name would indicate; connections to the main drain lines. These are usually laid underneath the road-bed in the shape of "herring bones", and sometimes called "herring bone drain system". These lateral drains are constructed at variable distances apart, depending upon the degree of saturation of the soil to be drained; they are resorted to only in very wet conditions, otherwise the longitudinal "French Drains" placed alongside of and just away from the edge of the pavement, are considered sufficient to draw the water out from under the pavement and to prevent water from coming under it from the adjoining lands. On the section of the Lincoln Highway above referred to, the drainage system was so effective that it lowered the level in the wells of farms along the road, to a considerable extent. At almost any time of the year, one may observe the outlet of the storm sewer, into which underdrains empty, a fair size stream of water, indicating that the ground through which the drainage system goes, is full of springs and thoroughly saturated with water. A few feet below the surface of the ground, in the section above referred to, was encountered a red shale which, in addition to the clay which lay on top of it, helped to hold all of the water that got into the soil.

The mention of shale brings to mind the importance of drainage in another case. One of the early concrete pavements in this State, was built along a road with a shale rock formation a short distance below the road-bed, and when excavating for the longitudinal "French Drain" along the pavement, the shale was taken out in good size pieces of what looked to be hard blue stone. Instead of buying other stone to fill in the drain ditch with, it was back filled with this shale "rock" which had been excavated and broken up. As is often the case with shale "rock", the admission of air caused disintegration, so that it formed a pasty powder under the wet conditions to be found in a "French Drain" ditch, and clogged up the pipe and outlets, so that the drain was not at all effective. The cracking up of the pavement on this road was attributed to this fact.

In the case above referred to, on the Lincoln Highway, the drainage has demonstrated its effectiveness, not only by the volume of water that may be observed running out of the outlet, but by the fact that the pavement, which is concrete, has not cracked up, to any extent that might be ascribed to lack of proper drainage. It is also significant to note that in the adjoining section of this portion of the

(Continued in February Number)



Before the abutments could be built, a great quantity of water had to be pumped out of the foundations to make it possible to pour the concrete. This photograph shows the pumping equipment necessary before the job of actually building the abutments could be started.

Contract News

Prepared to December 31, 1922

Jan. 11—Route No. 6, Section 8, Pearl St., Bridgeton, Reinforced Concrete paving job, 0.455 miles, 20 and 30 feet wide with gravel shoulders was awarded to the Tri-State Construction Company, Bridgeton, N. J., on their low bid of $76,302.36.

Feb. 8—Route 6, Section 5, Shirley-Oldman's Creek, Reinforced Concrete Paving job, 6.812 miles, 20 feet wide with gravel shoulders, was awarded to the Benjamin Foster Company, Philadelphia, Pennsylvania, on their low bid of $254,021.53.

Feb. 16—Route 6, Section 6, Oldman's Creek-Mullica Hill, Reinforced Concrete Paving job, 5.028 miles, 20-30 feet wide with gravel shoulders, was awarded to the firm of M. Staub, Swedesboro, New Jersey, on his low bid of $203,660.48.

Feb. 24—Route 14, Section 5, Cape May Court House to Swainton, Reinforced Concrete paving job, 2.987 miles, 20 feet wide with gravel shoulders, was awarded to the firm of Sutton and Corson, Ocean City, New Jersey, on their low bid of $118,776.16.

Mar. 8—Route 6, Section 10, Quinton to Marlboro, Grading and Graveling job, 5.994 miles, 20 feet wide, with earth shoulders, was awarded to the Masterson Construction Corporation, New York City, on their low bid of $79,793.17.

Mar. 8—Route 6, Section 11, Salem to Quinton, Reinforced Concrete paving job, 2.648 miles, 20 feet wide with gravel shoulders was awarded to Joseph F. Burke, of Plainfield, New Jersey, on his low bid of $111,833.79.

Mar. 8—Route 4, Section 9, Smithville-Mullica River, Warrenite Bitulithic job, on concrete base, 3.748 miles, thirty feet wide, with gravel shoulders was awarded to C. H. Earle of Hackensack, New Jersey, on his low bid of $374,533.77.

Mar. 8—Route 10, Section 1-B, Arcadian Way to Anderson Ave. in Fort Lee, Reinforced concrete paving job, 0.48 miles, 20 and 30 feet wide with earth shoulders, was awarded to the firm of John J. McGarry, Edgewater, New Jersey, on his low bid of $104,362.61.

Mar. 15—Route 11, Section 1, Main Street, Passaic, Sheet Asphalt job, on Concrete Base, 0.257 miles, 22 feet, 2 inches wide, was awarded to Union Building Construction Company, Passaic, New Jersey, on their low bid of $15,160.15.

Mar. 23—Route 4, Section 6, Eatontown-West Long Branch, Sheet Asphalt job on Concrete Base, 2.69 miles, 20 feet wide with earth shoulders was awarded to the Utility Construction Company of New Brunswick, New Jersey, on their low bid of $149,679.74.

Apr. 4—Route 2, Section 3, South Broad Street Storm Drain job was awarded to A. G. Thompson, of Trenton, New Jersey, on his low bid of $17,665.06.

Apr. 4—Route 2, Section 3, South Broad Street, Sheet Asphalt job, on Concrete Base, 0.648 miles, 48.5 feet wide, was awarded to J. J. Barrett, Trenton, New Jersey, on his low bid of $69,433.77.

Apr. 12—Route 6, Section 9, Salem-Collier's Run, Reinforced Concrete Paving job, 4.752 miles, 20 feet wide with gravel shoulders was awarded to Sampson & Reuter, Elizabeth, New Jersey, on their low bid of $196,975.08.

Apr. 15—Route 3, Section 8, Camden-Clements Bridge Road, Reinforced Concrete Paving job, 3.82 miles, 36 and 40 feet wide with earth shoulders was awarded to W. Penn Corson, Camden, N. J., on his low bid of $269,644.85.

Apr. 15—Route 3, Section 9, Clements Bridge Road to Kirkwood, Reinforced Concrete Paving job, 3.756 miles, 29 feet wide with earth shoulders was awarded to John M. Kelley Construction Co., Camden, N. J., on their low bid of $200,592.95.

Apr. 15—Route 3, Section 10, Kirkwood-Berlin, Reinforced Concrete Paving job, 5.576 miles, 29 feet wide with earth shoulders was awarded to John M. Kelley Construction Co., Camden, N. J., on their low bid of $297,993.89.

Apr. 18—Route 15, Sections 2 and 3, Bridgeton-Millville, Warrenite Bitulithic on Concrete base, 8 miles, 20 feet wide with gravel shoulders was awarded to the Tri-State Construction Company of Bridgeton, New Jersey, on their low bid of $455,500.12.

Apr. 18—Route 4, Section 14, Laurelton-Lakewood. 3.875 miles, Reinforced Concrete Paving job, 20 feet wide with gravel shoulders was awarded to C. H. Earle of Hackensack, New Jersey, on his low bid of $144,705.68.

Apr. 19—Route 4, Section 10, Shadow Lawn-Roseld Avenue, Sheet Asphalt Paving job on Concrete Base, 2.41 miles, 20 and 36 feet wide with earth shoulders, was awarded to Newark Paving Company, of Newark, New Jersey, on their low bid of $104,969.51.

Apr. 19—Route 4, Section 12, Sea Girt Avenue, Reinforced Concrete Paving job, 0.162 miles, 20 feet wide with earth shoulders was awarded to T. H. Riddle, New Brunswick, New Jersey, on his low bid of $8,569.23.

Apr. 21—Route 9, Section 6, Somerville-Bound Brook, Reinforced Concrete Paving job, 2.491 miles, 20 feet wide, earth shoulders was awarded to Salmon Brothers, Netcong, New Jersey, on their low bid of $131,710.10.

Apr. 24—Route No. 4, Section 5-A, Storm Drain in Red Bank, was awarded to Chas. J. Romano, Montclair, New Jersey, on his low bid of $15,314.85.

Apr. 25—Route 5, Section 5, Madison Avenue, Madison Township and Borough of Madison, Warrenite Bitulithic on Concrete base, 2.032 miles, 20 feet wide with earth shoulders, was awarded to the Northern Construction Company, of Newark, New Jersey, on their low bid of $117,844.37.

Apr. 28—Route 4, Section 13, Richmond Ave., Point Pleasant Beach, Reinforced Concrete paving job, 0.848 miles, 20 feet wide with earth shoulders was awarded to C. H. Earle of Hackensack, New Jersey, on his low bid of $35,471.76.

May 9—Route 9, Section 5, Union Avenue, Bound Brook, Sheet Asphalt on Concrete Base, 1.501 miles, 20 feet wide with earth shoulders was awarded to the Utility Construction Company of New Brunswick, New Jersey, on their low bid of $93,090.31.

May 26—Route 4, Section 15, Lakewood (County Section) 1.056 miles Reinforced Concrete Paving job, twenty-eight and thirty feet wide, was awarded to the Public Service Production Company of Newark, New Jersey, on their low bid of $75,748.82.

May 26—Route 4, Section 15, Lakewood (Township Section) 1.5 miles, Reinforced Concrete Paving job, 36 and 50 feet wide was awarded to C. H. Earle of Hackensack, New Jersey, on his low bid of $105,741.10.

May 26—Route 9, Section 8, North Branch-Somerville, 3.837 miles, Reinforced Concrete paving job, 20 feet wide with earth shoulders was awarded to Ralph Sangiovanni, on his low bid of $159,077.59.

May 26—Route 16, Section 3, Bedminster-Plukamin, 2.415 miles Reinforced Concrete paving job, 20 feet wide with earth shoulders was awarded to Ralph Sangiovanni, on his low bid of $135,648.39.

May 26—Route 4, Section 16, Main St., Toms River, 1.096 miles long, Reinforced Concrete paving job, 20, 30, 36, 38 and 56 feet wide with gravel shoulders was awarded to the Public Service Production Company of Newark, New Jersey, on their low bid of $62,864.59.

June 8—Route 5, Section 9, Barker's Corner-Hackettstown, 2.99 miles Reinforced Concrete paving job, 20 and 48 feet wide with earth shoulders was awarded to Frank J. Groman, of Bethlehem, Pennsylvania, on his low bid of $230,274.37.

June 8—Route 9, Section B, West Front Street, Plainfield, Sheet Asphalt paving job on Concrete Base, 1.929 miles, 40 and 41 feet wide, was awarded to the Union Paving Company, of Newark, New Jersey, on their low bid of $219,316.20.

June 10—Route 6, Section 12, East Commerce Street, Bridgeton, 1.314 miles long. Sheet Asphalt paving job on

Concrete Base, 20 and 32 feet wide, was awarded to E. K. Mixner Co., on their low bid of $80,422.01.

June 20—Route 2, Section 3-A, Whitehorse-Crosswicks Creek, 0.389 miles, Reinforced Concrete paving job, 30 and 40 feet wide was awarded to Daniel Klockner, of Trenton, New Jersey, on his low bid of $37,472.82.

June 21—Route 5, Section 6, Speedwell Avenue, Morristown, Warrenite Bitulithic surface on Concrete Base, 1.426 miles, 23 feet, 3½ inches wide was awarded to J. S. Geiger Sons of Newark, New Jersey, on their low bid of $144,892.74.

June 21—Route 9, Section 9, Phillipsburg-Still Valley, Reinforced Concrete paving job, 1.68 miles, 20 and 36 feet wide with earth shoulders was awarded to Crilly and Cannon of Phillipsburg, New Jersey, on their low bid of $110,345.40.

June 28—Route 1, Section 6, Trenton City Line-Nottingham Way, reinforced concrete paving job, 0.928 miles, 39 feet, six inches wide, was awarded to Rees and Taylor, of Trenton, New Jersey, on their low bid of $95,347.47.

June 28—Route 4, Section 11, Main Street, Avon, New Jersey, Warrenite Bitulithic surface on Concrete Base, 0.663 miles, 43 feet wide with earth shoulders was awarded to the East Jersey Bridge Company, of Perth Amboy, New Jersey, on their low bid of $54,814.34.

July 7—Route 4, Section 17, Barnegat, Reinforced Concrete job, 1.0 miles, 20 feet wide with gravel shoulders, was awarded to the Public Service Production Company of Newark, New Jersey, on their low bid of $43,931.94.

July 7—Route 4, Section 18, Tuckerton, Reinforced Concrete job, 1.5 miles, 20 feet wide with gravel shoulders, was awarded to the Public Service Production Company of Newark, New Jersey, on their low bid of $59,913.83.

July 11—Route No. 11, Connecting link-Route No. 10 and Route No. 12. Sheet Asphalt on Concrete Foundation, was awarded to the Franklin Construction Co., of Newark, New Jersey, on their low bid of $39,737.50.

July 13—Route 9, Section 7, Main Street, Somerville, Reinforced Concrete job, 0.497 miles, was awarded to J. L. Bachman of Linden, N. J., on his low bid of $74,180.25.

July 14—Route 16, Section 2, Mine Mount Road-Bedminster Corner, Reinforced Concrete job, 2.515 miles, was awarded to the Engineering Construction Corporation, Philadelphia, Pennsylvania, on their low bid of $166,802.65.

July 17—Route 9, Section 9-A, Still Valley-Bloomsbury, Reinforced Concrete job, 2.92 miles, was awarded to Bernard E. Tighe Construction Company of Easton, Pennsylvania, on their low bid of $127,785.84.

July 21—Route 5, Section 8, Great Meadows-Barker's Corner, Reinforced Concrete, was awarded to Salmon Bros., Netcong, New Jersey, on their low bid of $186,688.69.

July 25—Route 1, Section 13, Highland Park-Stelton Road, Warrenite Bitulithic on Concrete Base, was awarded to S. S. Thompson & Company, Incorporated, Red Bank, New Jersey, on their low bid of $305,394.61.

July 25—Route 1, Section 14, Stelton Road-Metuchen, Warrenite Bitulithic on a Concrete Base, was awarded to S. S. Thompson & Company, Incorporated, Red Bank, New Jersey, on their low bid of $344,784.65.

Aug. 9—Route 15, Section 4, Millville, Warrenite Bitulithic Surface on Concrete Base, 0.986 miles, 20 feet wide, was awarded to the Tri-State Construction Company, of Bridgeton, N. J., on their low bid of $55,796.67.

Aug. 10—Route 6, Section 14, Woodbury, Reinforced Concrete paving job, 1.505 miles, 20 feet wide and 46 feet wide, was awarded to the Public Service Production Company of Newark, N. J., on their low bid of $169,775.88.

Aug. 18—Route 10, Section 3, Little Ferry-Ridgefield, Reinforced Concrete job, 1.76 miles, 20 to 30 feet wide, was awarded to John J. McGarry, of Edgewater, N. J., on his low bid of $146,760.88.

Aug. 18—Route 10, Section 5, Hudson Street, Hackensack, Sheet Asphalt job, 1.449 miles, 20 ft. 4 in. and 42 ft. 6 in. wide, was awarded to G. M. Brewster, Tenafly, N. J., on his low bid of $140,205.49.

Aug. 18—Route 10, Section 5-A, Essex Street, Hackensack, Reinforced Concrete Paving job, 0.346 miles, 22 feet wide, was awarded to Ufheil and Phelan, Hackensack, N. J., on their low bid of $24,323.09.

Sept. 15—Route No. 7, Section 1, Corlies Ave., Neptune Township, Warrenite Bitulithic on Concrete Base, 0.949 miles, 33 feet and 38 feet wide, was awarded to the East Jersey Bridge Company, of Perth Amboy, New Jersey, on their low bid of $97,110.68.

Sept. 15—Route No. 4, Section 5-A, Maple Ave., Red Bank, Sheet Asphalt Paving job on Concrete Base, 1.308 miles, 40 feet wide was awarded to the Wm. P. McDonald Construction Company, of New York City, on their low bid of $109,560.95.

Sept. 15—Route No. 9, Section 7-A, Union Ave., Grove St., Somerville, Reinforced Concrete Paving job, 0.778 miles, 20 feet wide, was awarded to the N. J. Construction Company, of Hackensack, N. J., on their low bid of $77,549.47.

Sept. 15—Route No. 16, Section 4, Pluckamin-Somerville, Reinforced Concrete Paving job, 5.475 miles, 20 and 30 feet wide, was awarded to the Peconco Engineering & Construction Company, of New York City, on their low bid of $329,749.09.

Sept. 15—Route No. 1 and 13, connecting link through New Brunswick, Asphalt Block Pavement on Concrete base, 0.874 miles, 37.4 and 45 ft. wide, was awarded to the Utility Construction Company, of New Brunswick, on their low bid of $122,644.48.

Sept. 28—Route No. 14, Section 7, Petersburg-Greenfield, Grading and Graveling job, 1.99 miles, 20 feet wide with earth shoulders was awarded to Ross & Whelan of Trenton, N. J., on their low bid of $85,196.86.

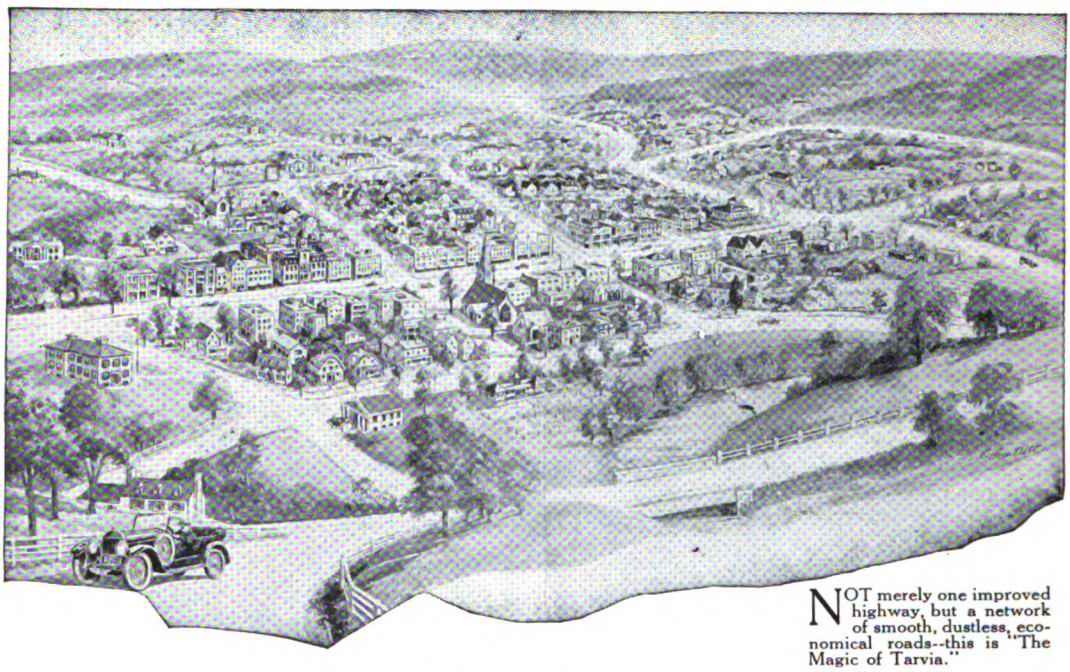
October 11—Route No. 11, Passaic Avenue, Passaic and Clifton. National Pavement on Concrete Foundation, was awarded to P. S. Kramer, of Paterson, N. J., on his low bid of $70,983.09.

October 16—Route No. 4, Connecting link-Perth Amboy. Sheet Asphalt surface on Concrete Base, was awarded to Graham & McKeon, of Perth Amboy, N. J., on their low bid of $185,216.62.

December 8—Route 4, Section 7-A, New Gretna-Alternate Gravel Surface job, 0.77 miles, 30 feet wide was awarded to Gibbs-Mueller Company, Philadelphia, Pa., on their low bid of $9,381.65.

December 8—Route 6, Section 12-A, Broad Street and Shiloh Road, Bridgeton, Sheet Asphalt Paving job on concrete base, 0.861 miles, 20 feet and 60 feet wide, was awarded to Fish-Rutherford, Inc., Philadelphia, Pa., on their low bid of $95,234.38.

December 8—Route 14, Section 6, Mays Landing, Warrenite Bitulithic on Concrete Base, 0.606 miles, 20 feet and 30 feet wide, was awarded to C. H. Earle, Hackensack, N. J., on his low bid of $43,549.63.



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The Magic of Good Roads--

HALF a century ago the railroads reached out into the wastes of the continent—tapped reservoirs of undeveloped wealth—lifted the pall of isolation from frontier life.

Today improved highways are completing the work that the railroads then began—are doing for individual districts what the railroads did for the country as a whole.

The old-time "isolated community" is rapidly vanishing. In its stead are seen progressive towns and villages—centers of ever-widening circles of business activity. This is the magic of good roads.

Nor are the benefits confined to towns and villages. Good roads make farming more profitable. They bring to the farmer and his family greater social advantages and better educational facilities. They make farm life more attractive.

Yet with all their blessings, good roads need not be expensive. Whether for residential streets or country highways, Tarvia is the quickest, surest most economical way to all-year roads, free from mud, dust and ruts and proof against water, frost and traffic. It is a coal-tar product made in grades to meet every road condition.

One Tarvia road in your community will prove to you and your townspeople how good roads, with all their benefits, can be had at low cost.

Illustratea booklets free upon request

Tarvia
For Road Construction Repair and Maintenance

The Barrett Company
40 RECTOR STREET, NEW YORK CITY

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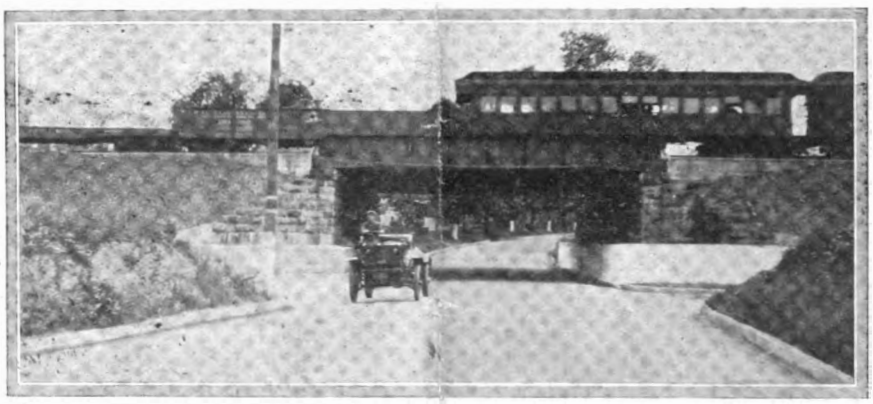
H. M. Smith, . . No. 96M, Riverton
C. C. Randolph, . No. 2466, Plainfield
Ashley Burner, . . No. 2232, Plainfield

ALONG THE ROAD



As rapidly as funds for the work are available, the "death traps" at grade crossings are being eliminated (Lincoln Highway, at Metuchen; State Highway, Route No. 1)

Exception Noted

Knowledge isn't always power. A man may know that he has run out of gasoline and still be unable to make his car go.

Plea Granted

Judge: "Why do you want your name changed, madam?"
Applicant (pathetically): "Please your honor, it's Lizzie Tinford."

Mirrors on Motor Trucks

Accidents on the highways could be greatly decreased by the passage of uniform state laws requiring every truck to carry a mirror, giving a view of the road immediately to the rear, and by requiring every horse drawn vehicle, as well as automobiles, to display some sort of light when using the roads at night.

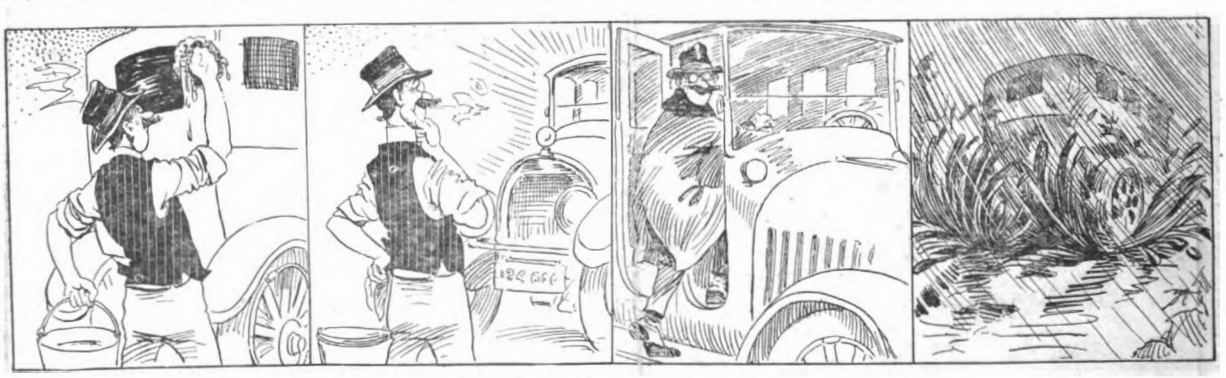
This is the opinion of M. O. Eldridge, director of roads of the American Automobile Association Good Roads Board, after making a careful digest of the traffic laws of all the states of the Union. Mr. Eldridge, in a report to the Secretary of Commerce, sets forth that 13 states have laws requiring the mirror on trucks but that very few have any regulation for horse drawn vehicles. The states requiring mirrors on trucks are Vermont, Washington, California, Connecticut, New York, Indiana, Kentucky, Maryland, Massachusetts, Michigan, Missouri, New Jersey, and the District of Columbia.

"Motor trucks need mirrors as they travel at a slower rate of speed than passenger cars, and the noise of the engine completely drowns out, in many instances, the horn of the motorist behind, who is blowing for the road,' said Mr. Eldridge. "Often they will swerve about the time the passenger car is about to pass, and this means an accident. As for the light on a horse drawn vehicle, the need for it is obvious, as a motorist, coming up behind such a vehicle and perhaps blinded by the headlights of a car coming from the opposite direction, cannot see the horse drawn vehicle until he is right on it. I believe that uniform state laws on these two subjects will go far toward decreasing the number of accidents which take daily toll of life, and the A. A. A. will do all in its power to aid in obtaining such laws."—*Highway Engineer & Contractor.*

She Had Mud On Her Shoes

He (driving up the curb): "Hello, little girl, wanta go for a ride?"
Sweet Thing: "Nothing doing, I'm walking home from one now."

The streets in hell must be in frightful shape, unless the good intentions used for paving last longer than they do up here.—San Diego Tribune.



"A SONG WITHOUT WORDS"
(*We've all done it, and it ain't no grand and glorious feeling.*)

MONTHLY BULLETIN OF DETOURS

Adopted by the New Jersey State Highway Commission

Corrected to January 10, 1923

All Detours Posted with Signs and Blazed with "Arrows"

Note:—The traveler will find poles banded along each route of the State Highway System to correspond to the colors indicating the direction of the routes.

Blue on the posts or signs indicates that the road is running **North** and **South.**
Red shows that it lies **East** and **West.**
While **Yellow** tells you that it takes a diagonal course **Northwest and Southeast.**
Brown indicates that it takes a diagonal course **Northeast** and **Southwest.**

ROUTE NO. 4, Section 11, Avon-by-the-sea, under construction.
No detour necessary. Traffic will go through construction.

ROUTE NO. 4, Section 17—Barnegat, under construction.
No detour necessary. Traffic will go through construction.

ROUTE NO. 4, Section 18—Tuckerton, under construction.
No detour necessary. Traffic will go through construction.

ROUTE NO. 5, Section 6—Speedwell Ave., Morristown, under construction.
Traffic being maintained.

ROUTE NO. 5, Sections 8 & 9—Between Great Meadows and Hackettstown.
Detour at Hackettstown on Main St. to Mountain Ave. to Route No. 12, thence to Washington, Oxford Furnace, Buttzville, and Route No. 5, Belvidere and Delaware.

ROUTE NO. 6, Section 14, Broad Street, Woodbury.
Under construction from railroad crossing at north end of town to Red Bank Ave. Detour Dear Street and Cedar Street.

ROUTE NO. 6—Mantua Ave., Woodbury, between Broad St., and present improvement south of Woodbury.
No detour necessary. Traffic will go through construction.

ROUTE NO. 6, Sections 10 and 11—Under construction between Quinton and Bridgeton.
Traffic can go through construction or detour from Salem through Hagersville, Hancock's Bridge, Harmersville, Canton, Gum Tree Corner, Town Hall, Kerns Corner, and Roadstown to Bridgeton.

ROUTE NO. 9, Section B—Plainfield, under construction.
Detour from Route No. 9 to Muhlenberg Place to West Second Street to Clinton Ave. to West Front St., or Route No. 9.

ROUTE NO. 9, Section 8—Under construction between Somerville and North Branch.
No detour necessary. Traffic will go through construction.

ROUTE NO. 9, Sections 9 and 9-A—Under construction between Bloomsbury and Phillipsburg.
Detour via Clinton, Glen Gardner, Hampton, Washington, Broadway and New Village to Phillipsburg.

ROUTE NO. 10, Sections 3 and 5—Between Little Ferry and Ridgefield.
Detour Main Street, Hackensack, to Fort Lee Turnpike to Grand Ave., Leonia, thence south over Grand Avenue to Ridgefield or North to Englewood.

For points south of Ridgefield and Jersey City from Hackensack, detour over Rochelle Ave., to Williams Ave., to Moonachie Road to Paterson Plank Road to Hudson Co. Boulevard.

ROUTE NO. 15—Between Rio Grande and Goshen, bridge construction over Biddle Creek.
Detour from Goshen to Cape May Court House and Route No. 14 to Rio Grande.

ROUTE NO. 16, Section 2—Under construction between Mine Mt. Road to Bedminster Corner.
Traffic can go through construction.

COUNTY DETOURS

In addition to the information concerning detours on account of State Highway construction, the following information is issued to advise the public of all construction on roads within each County and also to give an account of the different detours to be used in connection with this construction work. Detours are marked with directing signs and arrows.

ATLANTIC COUNTY

Downstown-Mays Landing Road under construction. For Atlantic City and Mays Landing from Downstown detour south on Lake Road to Wheat Road; thence northeast on Wheat road to Buena and Hammonton; thence east to Egg Harbor City; thence south for Mays Landing or continue east for Atlantic City.
For Richland detour from Buena south over the Tuckahoe Road to Richland Road.

BERGEN COUNTY

No construction work under way.

BURLINGTON COUNTY

Mt. Holly-Medford Road, under construction. Traffic being maintained.

Chester Ave., Moorestown, under construction. Detour over Third St., Stanwick Ave., to Bridgeboro Road.

CAMDEN COUNTY

Cove Road under construction from Burlington Pike to Camden St. Traffic being maintained.

CAPE MAY COUNTY

No construction work under way.

CUMBERLAND COUNTY

Landis Ave., Section 1—From Carll's Corner to Salem County Line. Detour from Pearl St., at Bridgeton Ave., over Rosenhayn Road to Rosenhayn and local roads around end of construction.

ESSEX COUNTY

No construction work under way.

GLOUCESTER COUNTY

Mantua-Glassboro Road under construction between Barnsboro and Pitman. Detour at Barnsboro over Ritchwood Road to Pitman Road via Alcyon Park to Pitman.

Chestnut Branch Bridge on Barnesboro-Sewell Road under construction. Traffic is being maintained for all loads under 3 tons. Other heavy traffic detour over concrete road from Barnesboro to Mantua, thence on Knights Run Road to Sewell.

HUDSON COUNTY

No construction work under way.

HUNTERDON COUNTY

No construction work under way.

MERCER COUNTY

White Horse-Yardville Road under construction. Traffic being maintained.

River Road from Scudder Falls to Washington's Crossing under construction. Traffic being maintained.

MIDDLESEX COUNTY

State Street, Perth Amboy. Traffic being maintained.

MONMOUTH COUNTY

No construction work under way.

MORRIS COUNTY

Long Valley-Hunterdon County Line Road under construction. Traffic being maintained.

OCEAN COUNTY

Jacksons Mills-Imlaystown Road under construction. Traffic being maintained.

Barnegat-Buddstown Road under construction. Traffic being maintained.

PASSAIC COUNTY

Cherry Lane, Hawthorne, closed between Wagarau Road and Diamond Bridge. Detour Lincoln Street and Washington Avenue.

Belmont Ave., under construction. Traffic being maintained.

Passaic Ave., between Passaic and Clifton under construction. Closed from Brook Ave. to Essex Co. line. Detour Bloomfield Ave., or Franklin Ave.

SALEM COUNTY

Elmer-Centerton Road under construction. Traffic will be maintained.

SOMERSET COUNTY

Watchung Avenue, Borough of North Plainfield, under construction. Traffic being maintained.

SUSSEX COUNTY

No construction work under way.

UNION COUNTY

Hillside Avenue, Liberty Avenue and Salem Road in Hillside and Union Townships under construction. Detour over local streets.

Springfield Ave., New Providence, under construction. Traffic being maintained.

Mountain Ave., Westfield, under construction. Traffic being maintained.

WARREN COUNTY

Washington-Buttsville Road under construction from Buttzville Hill to State Highway Route No. 5. Traffic is being maintained.